

For

Doct. Baker.

AN

INAUGURAL ESSAY

ON THE

SEAT OF ANIMAL LIFE.

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AN
ATTEMPT
TO INVESTIGATE THE
SEAT
OF ANIMAL LIFE.

SUBMITTED TO THE EXAMINATION OF
CHARLES ALEXANDER WARFIELD, M. D.

The President, and Medical Faculty

OF THE COLLEGE OF MEDICINE OF MARYLAND.

FOR THE DEGREE OF DOCTOR OF PHYSIC.

—○○○○○○○○—
By Henry Curtis....of Virginia,
VICE-PRESIDENT OF THE BALTIMORE MEDICAL SOCIETY.
—○○○○○○○○—

..... The spacious earth,
And all the teeming regions of the world,
Hold not an object to the curious flight
Of knowledge, half so tempting, or so fair,
As man to man. AKENSIDE:

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1812.

WILLIAM E. COLEMAN, SENIOR, D.D.

TO INVESTIGATE THE

AND H. KILPATRICK, M.D.

OF ANIMAL LIFE.

PRESENTED TO THE FACULTY OF

CHARLES ALEXANDER WATKINS, D.D.

THE President, and Medical Faculty

OF THE COLLEGE OF MEDICINE OF HARVARD

FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

AND A THESIS SUBMITTED IN CANDIDACY FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

BY HENRY CURTIS, M.D.

OF THE FACULTY OF THE MEDICAL DEPARTMENT

OF HARVARD UNIVERSITY

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TO

WILLIAM FOUSHEE, SENIOR M. D.

AND TO

JNO. H. FOUSHEE, M. D.

OF RICHMOND, VIRGINIA.

GENTLEMEN,

ACTUATED by the finest feelings of gratitude, I embrace with peculiar pleasure this opportunity of acknowledging and making, in some degree, public, my many obligations to you, who, with parental care, directed the gradual unfoldings of my mind through the morning of youth, and kindly afforded those means of improvement, calculated to raise industry to eminence, and crown it with success.

Should this first effort evince an advancement in the knowledge of the profession to which I devote my life. Accept its dedication as a tribute of grateful respect, from

Your much obliged,

H. CURTIS.

To the zealous and able friends of science,

JNO. B. DAVIDGE, A. M. M. D. and

JAMES COCKE, M. D.

Joint Professors of Anatomy, Surgery, &c.

In the College of Medicine of Maryland;


These pages are inscribed as a

Sincere testimony of

Respect and esteem,

By the

AUTHOR.

 *THE necessity of publication, will apologize, to my friends, for the form this essay has taken.*

PRELIMINARY OBSERVATIONS.

AS a subject for my inaugural dissertation, I am induced rather to offer some general opinions on the state of the animal system, than to enter into particular disquisitions on given points.

The time allotted, in general, for the production of inaugural essays, and the peculiar circumstances under which I have to write, preclude the hope of my advancing the science of medicine; I am therefore chiefly anxious not to embarrass its progress by hasty conclusions or fanciful chimeras. The opinions I have thought proper to bring forward are advanced with as much perspicuity and order as my application to other engagements would permit; and although they are founded, I trust, on manifest facts or inductions from established propositions, still I must submit them with diffidence: and should the ground, I have taken, prove untenable, I have to regret that my opportunities have not placed me on a more advantageous stand.

THESIS.

THE capacity and aptitude for motion, observable in man, naturally lead us to an enquiry into the general principle of his corporeal functions. To a disquisition of which I devote the following pages.

Aware of the intricacy of my subject, and that the operations of the animal body necessarily embrace agents not within the range of our senses, I cannot indulge in the hope that I shall be altogether successful in an examination of the laws of its economy. Where so many enlightened and able intellects have labored in vain, it would require an excess of vanity in me to expect to succeed; and, I trust, should I leave some of the difficulties unsurmounted and inequalities unsmoothed, I shall not be fairly chargeable with temerity or indiscretion.

Amidst our contemplation of the various simple and compound actions, of which the human body is capable, and in which it is perpetually engaged, we are unavoidably led to ask—whence is the peculiar power or capacity, so admirably diffused throughout its numerous parts, by which those actions are performed? Is it by any peculiarity of organization? or by properties different according to the nature of the various constituent parts? or a particular principle, not strictly inherent in any one part, but diffused to all? It cannot be in the organization, although it does not manifest itself without organization, for, if so, there would uniformly be a difference between the texture of

dead and living parts, which frequently is not the fact. Nor have we full and satisfactory evidence on which to found the opinion that it is owing to properties differing in their essential natures according to the parts concerned. That the principle of life or capacity of acting, or being acted on, is strictly the property of one part, and is by diffusion communicated to the rest, we have much reason to conclude from the phenomena of both health and disease.

Until experimental philosophy and inductive reasoning shall be separated from fanciful and hypothetical speculations, the science of medicine can meet with but slow success. And as we have not all the advantages attendant on the other physical sciences, having the operations of a living machine, if I may use the expression, to calculate, we must be content to move with a slower step. Nor must we commit our barque to the full and easy flowing stream of conjecture and hypothesis. Conjectures are ever vague and hypothesis seldom leads to the discovery of truth.

Some physiologists, and those of no mean note, have considered the operations of the human frame as a circle of functions governed by mechanical organic laws, as we discover in an hydraulic machine, or automaton, so admirably formed, as by the mere force of its construction to perform and continue the vital motions.

In confutation of such an opinion we have nothing to do more than to introduce the words of the justly celebrated Doct. Whytt. "It seems" (says that writer) "to be incumbent on those philosophers who ascribe the motion of the heart to mechanical causes alone, to demonstrate the possibility of a perpetuum mobile, since as long as life lasts, an animal appears to be really such." And it needs scarcely be added that perpetual motion is demonstrably

without the laws of mechanics, and far above the power of mechanism. These considerations are, I judge, sufficient to put to rest all idea of an independent *organic* life: If others are wanted, it may be shewn that life, sense, and self-action, are inconsistent with the general properties of matter.

Others, writers of much reputation and celebrity, have contended for the existence of an innate independent principle of life in the muscles, and the plausible ingenuity with which these opinions were supported, could not fail to procure many advocates, and has indeed enlisted in its cause such a body of respectable talents, as to induce me to hesitate in my intended opposition: Nor do I now venture presumptuously to undertake the settlement, but shall only offer such reasons in objection to the doctrine, as have been suggested by various circumstances. It is not my intention to engage in all the minuteness of particular discussion. That would require more time and attention than I can at present devote to such an undertaking; but I shall content myself by briefly stating all the arguments which have fallen within my reading, most insisted on by the strenuous defenders of the above doctrine, and on which alone it seems to rest.—Then, by considering the arguments separately, endeavour to shew wherein they are fallacious, and point out the difficulties calculated, in my opinion, to oppose such specious reasoning.

The punctum saliens, or the first visible point in motion being the heart;

The birth of full grown Fœtuses without brains;

The performance of vital motions without consciousness;

Eggs freezing with more difficulty from the time they are first laid in proportion to their freshness;—and,

The contraction of muscles after removal from the body;—are I believe the points most relied on as evidence

.....

of an independent living principle in the muscular system, and which shall now be considered in the order detailed.

In considering the condition of animals in their nascent state, we may readily understand, that their rudiments, composed of a pellucid congeries of parts, will freely transmit the light, and as there is no analysis of the ray, or proper reflection of it, it can make on the retina no impression, nor convey to the mind any perception of the existence of distinct parts. Soon however the vital energy manifests itself in the formation of red blood, and the motion of a point which being capable of reflecting light presents to the senses marks of distinct organization. Yet from this we derive no evidence that this point is the first to possess life, but only, that it shews itself first, by means of its reflecting powers. And thus though we admit the proposition, it can assist the cause it was adduced to support but little ; for the moving energy, we presume may be derived from co-existent parts. And indeed according to some accurate observes, the disproportionate head with other lineaments, appear visible some time before the heart is seen in motion.

That Fœtuses have in a few remarkable instances been ushered into a short lived existence without a brain, is advanced with some degree of elation by the supporters of the principle under consideration. Animals, from equally good authority, have been born without hearts: but will a few cases of *lusus naturæ* serve to disprove the importance of these organs to the animal economy? I fancy not; in either case above alluded to, we may suppose that the appendages performed, though imperfectly, the offices of their respective organs. And in those particular cases in which the brain is wanted, we may conclude with the learned physiologist, that it was destroyed by disease after the growth of the child, but left the nerves and ganglia

(which Doctor Monro considers small or disproportionate brain) endowed with sufficient influence to maintain for a short period its life. If there be an independent vital principle in the muscles ; why does not its power support those extremely rare cases, which unfortunately for the doctrine, as well as its advocates, do not generally survive birth any length of time.

No person, at all conversant with the phenomena of the passions, will deny the connexion between the mind and vital functions. It will therefore be only necessary to observe in answer to the third proposition; that sensation is predicated on a comparison of the past, with the present state of impressions, and that all are relative to some change in the percipient organ; heat is only sensible, because it was preceded by a lower temperature. And therefore objects which are equable in their application, and continued for a length of time, affect us but slightly; are unattended to when present, and cannot be recalled when past, must consequently escape our consciousness. Objects of minor importance operate continually on our senses, but may escape the observation when preoccupied, particles of matter passing before our eyes induce us to close the palpebræ, yet the action is not always attended to. Also the common action of the heart and arteries are not the subjects of our consciousness; the stimulus of the contained blood continuing nearly the same, conveys no impression to the mind; but let a fluid, however bland, be injected into them, and the animal will testify by its cries, the acute sensibility of the parts; or suspend their ordinary operation for a few moments, which may be readily done in some of the branches of the arterial system, and the succeeding action becomes very perceptible attended with much uneasiness and anxiety. The common action of the intestines are not generally objects of our attention, yet derange

or increase that action and they establish their connexion with the sensitive medium. This is rather a species of abstract reasoning, but we have positive cases on record: in which a British colonel could suspend at pleasure the action of the heart: the stomach likewise appears under the influence of the will, as is evinced in ruminating animals, and Professor Blumenbach gives an instance of a person in whom this organ was under the strictest command; also we have from the same authority, cases in which the Iris has been subjected to the power of volition; and indeed the parrot continually displays something of the kind. For such reasons I would not consider any part of the living body independent of the common sensory, but I can suppose that the mind by disuse or disease may lose its power over some organs, as it sometimes does over even the voluntary muscles. And I can see no reason why those motions called involuntary, could not be gradually withdrawn by want of attention from the direct influence of the mind.

That eggs resist in proportion to their freshness a reduction of temperature, is not in my conception necessarily owing to their vitality; which may be inferred from the circumstance, that as long as they were capable of being hatched, however stale, they must still retain their principle of life, and therefore, a stale egg able to afford a chick by incubation, should freeze no sooner than one newly laid. Another solution of the phenomena can be offered which may have escaped the attention of the ingenious experimenter. In the present state of chemistry, acquainted with the passage of heat through bodies, we know that the change of temperature in a tenacious semifluid must be very slow; caloric passing in such bodies, rather by transposition of particles than by their contact; the heat of the new laid egg is but little below 100° of Fahrenheit and

consequently must part with near 70° of heat before it could congeal. And having undergone that change, it would require some time to equalize its temperature with surrounding bodies.

If the egg does contain an independent principle of life why is not the chick evolved without the aid of other agents?

The last argument I shall notice on this fanciful hypothesis is not least in importance with the advocates for the independent principle but is one on which they place much reliance, viz. The contraction of muscles after removal from the body. There is little doubt that the contractibility of the muscular fibres is variously disposed in different animals and that particular parts may possess more tenacity of action than others; but if it were a constituent principle of the part, it should continue undiminished in power until the texture be entirely destroyed, and not gradually decrease in energy, as is the case, till it cease to act altogether. It may be strongly urged against this hypothesis that stimuli applied to the nerves soon after the death of an animal, produce more violent action than when applied to the muscles themselves; and much sooner destroy their aptitude for action, which fact, has been shewn true, by a series of ingenious and well conducted experiments, entered on by the learned doctor Whytt, of Edinburg.

Hence these propositions which have been displayed with no little triumph by the votaries of an independent life, can afford their opinions no support.

But the exertions of physiological speculators did not stop here, while they were seeking with such solicitude for the source of vitality, it is not to be supposed that such an important constituent of the body, as the blood appears to be, should escape unnoticed, nor did it. That the life was in the blood, seems an opinion long since suggested, but

it was treated rather as a figurative expression until revived and introduced to notice by the distinguished authority of Harvey. After him it obtained many advocates and zealous supporters in Europe and America. The opinion is entitled to notice, and I shall consider it with that principle of liberality and respect, which I think due to all opinions proceeding from such high sources.

Upon the supposition that the blood was the formative principle first existing in the nascent embryo, from the action of which the various parts of the body are evolved, it was styled the *Primum Vivens*. But could the blood circulate without vessels? propelled chiefly by a *vis atergo*, unless moving in tubes or vessels; I apprehend it could never revolve in a circle and perform by secretion, the functions so necessary to the growth and nutrition of the body.

Ingenuity, put upon the stretch, has drawn in support of this visionary speculation, arguments from the coagulum of the blood assuming appearances somewhat resembling muscular contraction, "and" (we are told) "as contraction is the life of the solid, if we find any thing like it, we should call it the living principle of the blood."—On the same foundation we may assert the vitality of jelly, which can be dissolved and coagulated again, and again, present the same appearance of contraction.

This quality of blood not peculiar to itself, can be referred to physical causes alone, seeing it separates spontaneously when drawn from the body, into *crassamentum* and serum, we are satisfied its parts are not united by chemical solution, properly so called; but are rather mingled together and kept in intimate mixture by the continual action and agitation of the circulation, for when at rest, the different parts occupy the situation assigned them by their specific gravity, and mutually recede, from the loss of caloric, and by the attraction of aggregation.

An enlightened defender of this opinion of our own country, with his mind apparently more highly imbued by speculative enquiries, than the observation or proper application of facts, endeavored to substantiate a living principle in the blood from the manner in which it is influenced by chemical agents, and has brought forward experiments which, though conducted with some address appear to have been introduced rather to quadrate with preconceived opinions, than with a spirit of impartial investigation.

Portions of blood drawn from the veins of healthy persons were subjected to the influence of electricity, which were observed to separate sooner than other portions set by as standard marks, from which it was inferred that the stimulus must have acted on a principle of life, to increase its action. To this inference I shall only offer general objections. In the present state of our knowledge, we know that the blood though apparently homogeneous is resolvable by agents into several parts; its crassamentum is composed of gelatinous fibres and red particles, kept in intimate mixture with the serosity by a combination of concurring circumstances, which being destroyed by the operation of chemical agents the separation is precipitated.*

The life of the blood has also been inferred from its resistance to a reduction of temperature, similar to that of a fresh egg. In a former part of this work I endeavored to shew the fallacy of such an inference, as the circumstance might arise from its peculiar consistency; but in the case of the blood, its temperature will be maintained sometime during its coagulation, by the latent heat disengaged in its change from the fluid to the denser state.

As Mr. John Bell has in a striking manner contrasted the arguments in question from which a vital power has

* See observations on albumen, and some other animal fluids, with remarks on the analysis by electro-chemical decomposition.——Philosophical Transactions for 1809:—page 373.

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 been inferred, I shall take the opportunity of transcribing his own words. "We are informed that a fresh egg in consequence of being alive resists the cold, and is frozen with greater difficulty; but once frozen and thawed again it loses its living principle and power of resisting cold at once. It freezes now at the same temperature with other animal matter, shewing no longer any power of generating heat, or resisting cold. But we are told (by Mr. Hunter) that the blood having a determined period of coagulating, you may during that time freeze the blood and it will thaw again and yet congeal at its proper time, and he tells us he had very cleverly frozen blood during the time of its flowing from the vein, then thawed the cake, and still in due time it coagulated. Now since the egg resists the cold by its living principle, why did it die or lose that principle during its conversion into ice? or rather since the blood coagulated by a living effort, how did it preserve its living principle after being frozen?" This shews that the coagulation of the blood has no relation to a living power, but is rather a characteristic of some dead animal matters.

Conclusions have likewise been erroneously drawn from the fact of a limb, dying when the supply of blood is cut off from it, but which circumstance serves to prove that blood is the most natural stimulus, and is essential to the perfect organization of the part; but the blood is nothing without its oxygen. Abstract heat, which is an exciting agent next in power, and you produce a like effect; mortification and death, will ensue; yet no one will pretend to say that the principle of caloric which pervades all matter is life.

But let it not be supposed while I thus object to the reputed vitality of the blood, I wish either directly or indirectly to detract from the importance of its use in the animal system. Conveying the principles, which acted on

by living organs form the various parts, and presuming it the most general and applicable stimulus of the body, I can still conceive its importance, and appreciate its value though itself be dependent on external agents for its essential qualities.

Thus has the vital influence, passing for ages through all manner of speculations, and tortured in all the variety of fanciful inventions, been secured for a while in a doubtful repository by the ingenuity of its advocates, or the authority of names, but it now comes to be ousted from its local habitations, a dependent wanderer throughout the body, for after all its changes we find it of later days expressed in the excitability of Dr. Brown, acted on by external stimuli. "I say the excitability of Dr. Brown," though it is asserted that many before him advanced the opinion of the dependent state of life on external substances; because I am willing to allow him the credit, at least, of being the first promulgator, and most zealous supporter of this simple hypothesis.

Dr. Rush tells us in his publication on "animal life" that Dr. Cullen advanced the opinion in 1766, that the Edinburgh professor afterwards deserted it; and that *he* (Rush) never did, but made it the foundation for many of his rules of practice, and actually advocated the doctrine in his course of lectures in 1771. And thus, we are given to understand, slept unheeded and unapplied, in the manuscript sheets of that professor, this important germ of a grand system, calculated by its simplicity to revolutionize all former theories of medicine, until by the arduous exertions of Dr. Brown an imperfect fabric was reared, serving at least to point to the right path, after enquirers. This digression will be excusable, in an attempt to fix, while adverting to the origin of, the opinion, and however the ques-

tion of priority may be decided in the minds of gentlemen, whether they give credit to Dr. Cullen for the first suggestion, or to the discriminating mind of Dr. Rush as the strenuous supporter, they will not deny to Dr. Brown the merit of first publishing—of overcoming the prejudices against, and at length drawing the attention of the medical world to this novel doctrine.

In reviewing the ideas of Dr Brown on the mode of existence of *his* excitability or vital principle, they appear not sufficiently definite to require much attention. His fundamental principles, though correct in the general, seem not to have been properly investigated by himself, and therefore erroneously applied, and indeed in his own case completely perverted. But I think, on the whole, we may attribute his errors rather to the enthusiasm with which he conducted his speculations than to the fallacy of their nature. Looking forward with eager triumph to the ultimate end of his object, he appeared little solicitous to enquire after the cause, or seat, of vitality. But assuming the principle, that whether it was a quality or substance, it was an indivisible property, a certain quantity of which was assigned to every living being at the commencement of its existence, which quantity determined the duration of life, led him into many inconsistencies, and has afforded ground for some of the strongest arguments that can be brought against his hypothesis.

I ought probably, in this place, to pay some attention to the theory of life advanced with much ingenuity by Dr. Darwin. But not feeling disposed unnecessarily to expatiate, I shall avoid a detail on this subject, it being sufficient to remark that his sensorial power appears too physical to solve alone the phenomena of life; it is attributing a power to matter, which I believe, however modified, or refined, it can never assume.

Having thus taken a cursory view of the most prominent opinions which have fallen within my observation, and endeavoured to shew them, rather as the scintillations of imagination, than the effulgent light of reason, suited to guide us through this mazy labyrinth, of metaphysiological investigation. I shall now proceed with what I presume at least the more unexceptionable explanation, and better adapted to the wisdom that regulates all nature.

From the most remote periods of antiquity, philosophers have not been inattentive to the peculiar differences that discriminate animate from inanimate matter, and under some modifications the distinction has been attributed to a principle called life, which not sufficiently understood in its nature, is only to be known by its phenomena, or symptoms.

Writers of high rank in the literary world, have, in their ardour to define its operations, called life a forced state, in consequence probably of observing, that when all external agents are withdrawn, its effects cease to be evinced in a plenitude of action. But were it becoming in me to cavil about modes of expression, I would only call the manifest symptoms of life forced as dependent on external agencies for their continuance. Life being rather the quality that distinguishes dead from living matter, and which may consist in an aptitude to action, and can remain for some time after its active effects cease to be obvious.

This aptitude will continue in some animals longer than others, probably owing to the peculiar manner in which they are influenced by stimuli; look at the large class of hybernating animals; though they are in their retreat to all appearance dead, none of the evident symptoms of life shewing existence, yet we may conclude that its influence still pervades their systems and preserves their bodies, composed of a variety of elements disposed by their pro-

perties to run into discomposition, from the disorganizing effects of chemical action.

This disposition of animal bodies to action, it may be observed, admits of increase or diminution. When the same substances produce more action, the aptitude may be supposed accumulated, or its energies increased, when less action, we may suppose it diminished; and when no action at all, under any circumstances we may conclude it destroyed, and here the capability for action ceasing altogether, discovers the difference between dead and living matter. Hence remarking its various vicissitudes with respect to energy, and its regeneration when not too much impaired, I am disposed to refer its origin to some source capable of supply, and not to an inherent or insulated quality.

Seeking for the medium through which this vital influence immediately operates, I am induced to turn to the brain as the point where all the powers of the animal appear more completely concentrated, and its continuations the (nervous elongations) as the active agents of life, existing more or less through the whole body. This proposition, I shall endeavour to support by direct and collateral arguments, adduced with as much perspicuity and brevity as possible.

Much may be argued from the importance of the brain in the economy of the system and the rank it occupies in intellectual operations. And though the mode of connexion between mind and matter, and the living principle and it, be not demonstrable to the senses, and will probably forever remain among the arcana of nature, yet we continually witness their effects and may conceive them a quality impressed under particular circumstances on the nervous system: possibly something in the way that bo-

dies are endowed with the power of affinity or principle of gravity. And although I leave it to the researches of the metaphysician to explain how mental phenomena are produced through the agency of matter, and how the sentient principle acts again through the same mean. Still we may trace their proximate cause to the nervous medulla and brain, as the common centre of communication between all parts, and as the direct medium through which external substances act, and which again produce a re-action.

Injuries or inflammations of the brain are attended immediately with derangement of organs, or the most destructive consequences; whereas injuries of other parts, essential to the powers of life, and therefore called vital, appear rather by indirect means to impair the bodily functions; necessary to the proper performance of which, there is a very delicate organization of the whole, existing in close dependence on the circulation, or (the tout ensemble) of organic life.

We may also argue something from the tenacity of life possessed by the nerves. While other parts of the body, even bone, may be destroyed by pressure, the nerves resist its destructive influence, as is evinced in the ligature of the surgeon passed round them in awkward operation, ⁵ for however tight it may be drawn; it only impairs the communication between the extremity and the sensorium commune, producing no slough or death, as in other parts. Again,

Our evidence of life is most clearly evinced in an alternate state of contraction and relaxation of parts. To which effect a nervous influence appears essentially necessary, for destroy the continuity of their chords, and though all other circumstances may remain the same, the action is prevented from taking place. "When the recurrent nerve on one side of the larynx is cut, the voice becomes sensibly

weaker, when both are cut it is entirely destroyed." From whence it is plain that the moving power is intercepted. But it may be, and I am aware it has been objected, to this inference that muscles may be made to contract by the application of stimuli after excision from the body. Which fact in my estimation only serves to prove the great tenacity and subtilty of the nervous influence. Anatomical research has traced the ramification of the nerve through all the fibre entirely diffused even till lost in pulp, and no one I believe has reason to doubt the complete dependence of *sensibility* on the presence of the nerves, yet there is no instrument, however sharp, that can touch a single point in a muscle without producing a sensation more or less acute; which circumstance shews the entire distribution of the nerves. And until every part be entirely removed, I presume they may communicate their influence; which upon the application of stimuli will be evinced, though in a feeble and irregular manner.

I therefore conclude we can not concede the important *vis nervæ*, the direct influence of which is supported by demonstration, in favour of an imaginary inherent, or any other property of muscular matter.

An experiment of Billinies, since repeated with success by Doctor Monro, goes far to establish a positive effect exercised by the nerves in muscular motion. "After opening the thorax of a living dog, catch hold of, and press both the phrenic nerves with the fingers, the diaphragm ceases immediately to contract. Let go the hold of the nerves and the muscle acts again, pinch a second time the nerve or nerves, some way above the diaphragm, the muscle again ceases to act, keep firm hold of the nerves, with the fingers of the other hand strip or milch it down from the griping fingers towards the diaphragm, and the muscle is made to contract; and for three or four strippings or

milchings, the action follows or obeys the motion of the fingers which strip it down, then it becomes disobedient and contracts no more, strip as you will, unless the finger, griping the nerves let go their hold and pinch farther up, when the muscle may again be made to contract, by stripping down towards the diaphragm.—Also, an experiment performed by Dr. Whytt, in which he injected a strong solution of opium into the stomach and intestines of a living frog, after his heart was taken out; “in thirty minutes he appeared quite dead, and neither pricking or tearing its muscles produced any motion in them, or the members to which they were attached” but the doctor tells us, on irritating the spinal marrow with a probe, the limbs contracted feebly. Here there could have been no *vis insita*, or it would have evinced itself on the application of the mechanical stimulus to the muscles. And indeed the whole experiment rather serves to prove the entire dependence of the muscles for irritability on the nerves, for when rendered incapable of being excited, they were again brought into action by the remains of nervous energy, in the *medulla oblongata*, (called forth by the probe.)

These considerations will I judge establish the direct influence of the nerves in muscular motion. And though its peculiar nature and qualities be unknown, an impenetrable veil shrouding it from observation, we may remain satisfied with a knowledge of the existence of an effectual cause. And as far as we may be allowed to infer from the general plans and regulations of nature surrounding us, seeing she delights in simplicity and uniformity, producing the greatest number of effects by the varied combination of a few elementary principles, we may rationally refer all the apparent complexness of the animal economy to the diversified influence of this nervous agent, particularly modified and applied to the variety of operations in the bo-

dy, yet all tending to a unity of effect. And as simplification in our particular science appears the order of the day, I may be justified in supposing the irritability, sensibility, &c. of authors, but varieties in the action of this principle.

Thus far we move with reason, beyond this point all is conjecture "and shadows, clouds and darkness rest upon it."

When we compare the two conditions of life and death, and see that all the corporeal or material parts remain in the latter state, and know at the same time that in life there was some thing that produced the characteristick thereof, we may rationally conclude that the endowments of life was some very subtile or spiritous principle which resided in, and influenced those parts which remain even after it has vanished.

In conclusion I will only observe, it is to the brain and its nervous system we should attribute the residence of vitality, which completely distributed and influenced by proper circumstances produce all the powers of the living system. It is there we find a remote cause and need seek no farther, but if it were necessary to approximate nearer to an efficient cause, I would take a general survey of the extensive field of nature, and observing the design and order that pervades all her regulations, refer their operations to immutable laws arranged in consummate wisdom, and intelligence, pervading all matter, and particularly modified in the human frame to fill the scheme of divine intention, whatever that may be.—Such general laws diffused through all extent, are the immediate attributes of a God—

All are but parts, &c.--POPE.

Before I close these desultory observations, permit me to express a wish for the success and prosperity of the insti-

tution from which I am receiving the honors of physick, and the general obligations I am under for many advantages and improvements derived from the lectures of its enlightened professors. Satisfied that comparisons are always indelicate, and might in the present instance prove particularly offensive, I forbear to particularize advantages, but must, however, indulge in an expression of the gratification I feel in seeing the art of medicine once more assume to itself the form and character of a science; order to take the place of confusion; and system, the first effect of genius, triumph over the extravagances of whim, and love of innovation.

FINIS.

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